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PROCEEDINGS OF THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club in Philadelphia on Wednesday, March 1, the president, P. D. Wanner, occupying the chair.

The Executive Committee's report referred to the absence of profits to foundrymen on business undertaken during 1898, and to the discussion on the subject which formed part of the proceedings of the last meeting of the association. Since that meeting, the report stated, the committee had found one or two foundrymen who had profited by the lessons arising out of that discussion, and had absolutely refused to renew some of their orders at former prices, notwithstanding that the customers insisted that the prices formerly paid were higher than had been offered by other founders. This evidence of backbone resulted in a higher price being obtained, and the patterns remaining at the foundries. The customer in the market for castings understood the situation, and used the name of one foundryman as a club with which to knock the other foundryman down; and as there was no understanding existing between foundrymen in general such a state of things might continue indefinitely. With pig iron and raw material advancing the foundryman was entitled to at least the difference in the cost of his castings, but

from timidity he did not ask an advance, fearing his competitors might get the patterns he had held contracts on. The report further emphasized the importance of foundrymen demanding higher prices, and the belief of the committee that they could be easily obtained.

The chairman, in commenting upon the report, drew attention to the danger threatening foundrymen who had taken low priced contracts and had failed to cover them by purchases of pig iron. The strong advances in the pig iron market to-day, he said, were equivalent to those made in the same market during the exciting period of 20 years ago. History generally repeats itself, he said, and who could say that something of a repetition of those times might not be experienced? Of course, things had changed very much since then, but he would not be surprised to see some grades of pig iron go up to $25 per ton. The fact that prices had advanced was not the only thing in the situation. A most serious question was that it was difficult to book for prompt delivery at any price. If any one doubted that, let them go into the market and try to buy. If much work was taken now by foundrymen for delivery within the next two or three months they might find themselves in a fix, unless their supply of pig iron was assured. The funniest thing about the situation was that in spite of the scarcity of iron, and a material advance in the price of it within the past year, the prices of castings had not advanced to any extent. This would apply to all branches of the foundry trade. Foundrymen were certainly entitled to better prices from a market standpoint, and the subject was worthy of profound reflection.

The secretary reported a desire on the part of certain members of the association to get the association to take up the question of credits for the protection of its members. It had become quite a common thing, he said, for unscrupulous persons to run up a heavy bill for castings with one foundry, and when defaulting in payment open an account with another and so on. He instanced a case where four foundries had suffered from one such customer. Various ways and means of notifying foundrymen

of such dealings were discussed, but the matter was finally referred to the Executive Committee.

F. A. Riehle, Riehle Bros. Testing Machine Company, Philadelphia, then read a paper on "Testing Machines," illustrating the same by a number of lantern slides.

TESTING MACHINES.

It is a strange coincidence that our first paper upon the subject of "Testing Machines" should be read before the Foundrymen's Association of Philadelphia, and that the first testing machine our firm was called upon to design and construct was for a Philadelphia iron foundry. The party referred to was at that time one of the most prominent in this locality, and the member of the firm who called to consult about it and finally ordered the first tester is still living. I mention this fact because most of the firms with which we had dealings, nearly 33 years ago, have passed away—that is to say, the partners of the firms, and especially the senior members. The name of the gentleman above mentioned is Mr. Samuel Fulton, of the firm of S. Fulton & Co., who had an extensive pipe works at Conshohocken, near Philadelphia.

The necessity for a machine was urgent, and it was of the greatest importance that we should have it constructed as rapidly as possible in order to make an immediate investigation as to the strength of the iron used in pipe they had constructed for a contract. We never learned as to the quality of the iron tested but understood that it was satisfactorily demonstrated that the quality of the iron was up to the specifications, and are under the impression that the information thus gained settled a pending lawsuit and that it was in favor of our Conshohocken friends.

The matter of physical testing of materials, while it may be considered a hackneyed subject to many, is, we believe, just in its infancy, and we are convinced that the time will come, and in fact, is near at hand, when every up-to-date manufacturing plant will be considered to be ill-equipped without a testing department. In fact, some parties have stated that they consider

their testing machine the most important tool in their works and, to quote from their letters, they say: "We could not run our establishment without it." While very imoprtant results are being obtained by the testing of materials in the form of test specimens, the most valuable and far-reaching results will be obtained by testing all forms of machinery, or sections of machinery, and structural forms in their full, usable size, as far as it is possible, and by an occasional test of such forms to destruction. The desire for a test of this nature is manifested when a test is made of a bridge after it is placed in position, by loading it with a very, very great weight. This has been, and can be, done by placing upon it as many of the heaviest type locomotives as it will hold; this test goes to check up or prove the result obtained by theory and by testing the component parts of the bridge upon a testing machine. Frequently parties prove the strength of a small structural member by piling railroad iron or pig iron upon it up to the full strain to which it will ever be subjected in actual practice. This is a very satisfactory and correct way of testing, and in the absence of a large enough testing machine to take in these small structures (we of course do not refer to a large bridge) is the only proper test that can be obtained.

At the present time chain manufacturers are required to make tests of the chain after it is finished and ready for use, and one section of chain in every certain number (say every 10 or 20 sections) is broken. Spring makers also test their springs under the same conditions as they are used in actual practice. Building material, small structural pieces such as brake beams, car bolsters, etc., can be tested with beneficial results in the sizes used; also timber and similar material. The benefit of testing materials to destruction and in full sizes is being more appreciated daily, and the most important results have been attained, and especially in regard to tests of timber. As far as we know, the testing of timbers has been more exhausted that that of any other substance. The United States Government has accorded a great deal of attention to this matter, and furnished extensive

and elaborate reports based upon the results of these experiments. Extensive and valuable researches have been made by the United States Government of iron, steel, and alloys at the Watertown Arsenal by carefully prepared test specimens; but these tests are not as important to iron and steel manufacturers and users as if the material was tested in full sizes. It is an important fact, and should not be overlooked, that tensile tests of small specimens run up higher than tensile tests of the same material in larger sections.

Some time ago a very large contract was made for furnishing steel bridge members in large diameter—we think in five inches diameter, perhaps more. The contract was based upon the result of experiments and tests made on the same qaulity of material in the form of test specimens one inch or one-half inch area. The result was that the strength of the large members did not come up to the specifications and the material was rejected, and the consequence was it ruined the company. Any one can constitute himself a testing machine by breaking a piece of thread or cord, thereby making a tensile test; or, he can break or bend a piece of wood or thin piece of steel upon his knee, making a transverse test. A person makes a compression test when he steps upon a floor or frail piece of mechanism. The comparative strength of two, three or more specimens can be very readily perceived, but the test is limited to the strength or weight of the individual. This method of testing, or some crude device, will answer for some people, and has served for everybody—before the introduction of testing machines. Every one wants to procure the strongest material obtainable, provided the price and other requisites, such as appearance, bulk, etc., are suitable. Then arises the question, not as to whether one specimen is stronger than another, but precisely how much stronger. Frequently parties have found upon investigation that they are using too much material for their purposes or necessities; then comes the matter of economizing or reducing the size or quantity of the article sufficiently to meet their ends.

The pipe manufacturers were among the first people to purchase and use testing machines. Four or five firms procured them in quick succession; among others, R. D. Wood & Co. for their Florence Works, Warren Foundry, and several others. Soon after a law was passed in Congress that all iron and steel used in the construction of boilers for the United States Government should be tested for tensile strength. It required that coupons should be cut from boiler plate and each coupon tested for its tensile strength. The United States was then divided into ten districts. It may have been divided into more; but an order was given for 10 testing machines for 10 districts; probably the other districts were not important enough to require a testing machine for this purpose. At the present time we think there are 14 or 15 districts in the United States, and are under the impression that each district has a testing machine for this special purpose. At this time (we refer to the time when the government supplied itself with the first testing machines), the testing of iron, metals and alloys received greater attention, and the action of the United States Government led to the use and purchase of testing machines by all the prominent boiler plate makers, and subsequently by rolling mills, steel and iron works. Shortly after this period testing machines were introduced into colleges and universities in the departments of mechanical engineering. Simultaneously with this wider use of machines, railroad companies took up the matter of physical testing of materials, and physical testing laboratories on varying scales were established by the leading railroad companies throughout the United States. The Pennsylvania Railroad was among the first to avail itself of the advantages of this new device and procured a couple of Riehle testing machines over 20 years ago. We believe they are in active use at the present time, and have been continuously since the time of their installment.

To trace the use of machines still further, we might add that the pig iron manufacturers began to appreciate the value of testing their iron before placing it in the hands of the public, and

they too invested in testing machines. The manufacturers of charcoal iron invested first, and subsequently the manufacturers of anthracite iron. Since this time the large machine shops and progressive manufacturers of every kind of material have been making physical tests of the articles entering into the production of their finished goods. And then more recently still, all manufacturers who can possibly arrange it are testing the actual finished product in the full size and form in which it is used in practice.

It is impossible to give you an adequate idea either of the variety of testing or a list of the various articles to which tests are, and can be, applied. As to the articles, the principal tests are of iron, steel and alloys; then building material, such as wood, bicks, stone, asphalts, cement, etc.; then wire, chain, wire and hemp rope, cloth, canvas, leather and canvas belting, leather, oils (for their lubricating qualities), hose (for its resistance to bursting), brake beams, car bolsters, car springs, parts of bicycles, wheels, etc.

Some of the tests on these articles are by tension, transverse and compression strains; torsion or twisting strains; abrasion, indenting, shearing, bursting; and we might include a drop test of brittle substances, such as crockery ware, glassware, etc., which test is introduced by the United States Government in its Quartermaster's Department.

The extensive use of wire for telegraph, telephones, musical instruments, etc., has led to the construction of testing machines built especially for testing this substance. Wires are made of alloys (many of them), and manufacturers desire to test the quality of different mixtures and temper of the wires by pulling, bending, twisting and breaking; also breaking by the greatest number of bendings, just as one would break off a small piece of wire with the fingers, and they come with all their various and difficult problems to the testing machine manufacturer to devise some special appliance to satisfy their every want. One piano maker wished to procure a wire of a certain mixture, size and temper, such that a given strain applied to it would produce a certain

tone, say key of A or B, and so on. This required fine calculations and great skill on the part of the manufacturer and finisher of the steel. We merely mention this incident to show how testing and results go hand in hand.

The first machine constructed at our works was a very crude affair compared with the style of testing machines made since. It consisted of a compound parallel crane beam suspended in a wooden frame about eight feet high, and from a stirrup connected with an old-fashioned Shaw & Justice hydraulic jack. Below the crane beam were suspended tools for gripping the end of the tensile test specimen. Secured to the lower part of the frame were the tools for gripping the other end of the tensile test specimen. On a wooden projection rested a hand power hydraulic pump. From this pump was adjusted a tube carrying the fluid from the pump below to the cylinder of the jack. As the pump was operated the plunger of the jack, the stirrup and the crane beam were raised, and the test specimen being secured in the grip holders was strained and the strain weighed by weights placed on a bale or weight-dish suspended from the end of the crane beam. While plain and true, it was still an accurate and reliable testing machine, but exceedingly awkward.

The next style of testing machine was one of 150,000 pounds. This machine was as crude as the one just described. The crane beam, plunger, jack, and hand pump were the same as used in the first machine, but instead of the test specimen being pulled direct away from the crane beam, the latter was connected with the lever which increased the capacity of the crane beam five times. From this increasing lever the tensile tools were suspended and the specimen secured thereto. Both these machines, or machines precisely similar, and made by us, have been in constant use ever since they were made. We made several of each form. One of the first boiler plate makers to buy one of these large machines was Messrs. Gaylord & Co., Portsmouth, Ohio. Since these first crude machines were constructed many improvements have been made in every direction. The first machines, as you were informed, were made with wooden frames.

They were afterwards made with iron frames. The first call for iron frame machines was from the government, which ordered 10 iron frame machines for the Department of Supervising Inspectors of Steam Vessels. Then, as the requirements of the public demanded, machines were made in larger capacity and for a greater range of usefulness. Afterwards, parties required that machines should be arranged to work automatically; that is to say, as the strain increased, by means of the straining mechanism, the poise on the beam, instead of being moved by the hand, was advanced by an automatic appliance. The poise moved out until the weight on the beam exceeded the strain on the test specimen, when the beam dropped and the motion of the poise ceased until the strain again increased. By an adjustment, the poise can be made to move quicker or slower, so the beam will act more in harmony with the quality and nature of the test specimen. If the test specimen is brittle, the poise must advance quickly, or else the specimen will break before the poise reaches the braking strain on the beam. On the other hand, if the test specimen is tough or ductile, the beam must advance much slower than the straining mechanism. The skill and experience of the operator will soon determine the proper speed of the automatic adjustment.

You might be interested in some incidents that occur in connection with a testing laboratory. The experience is certainly a varied one, and you would be surprised to hear a list of the articles and materials that come to hand for testing. It would be impossible to give you a list, but we might mention some. Some one brings a small article, so small that it is impossible to hold it in the grips; others, too large pieces, that it would be impossible to test as they desire. We have made tests of cold pressed bolts, and hot pressed bolts, for their shearing qualities. One party brings an ordinary nail and a patented nail, and wants to prove, by way of experiment, for a patentee or publication, which nail requires the most pressure to make it pass into a piece of wood, and wants another test to see which style of nail takes the strongest hold on the wood, and then to com-

pare the appearance of the fibres of the wood which the nails have displaced. People bring a piece of pig iron for tensile test —even a brick for tensile test. These, we inform them, have to be properly shaped to make a suitable test. Another party wants to learn the strain, by pressing, that the hub of a wheel will stand, by the pressure of a spoke into the hub; namely, an ordinary hub as compared with a patented hub and spoke. The first bicycle wheel, now in common use, was tested at our laboratory, and the results surprised both the maker and the patentee. Frequently very suspicious pieces of metal come to us to be tested and the parties require that an affidavit of the test be made by the engineer. This savors of the unpleasant suspicion that we may be called upon to give some testimony in a court. We even had a piece of rope sent us to be tested, and while the matter was never plainly mentioned, from what we gathered it gave color to the impression that it was tested for the purpose of seeing if it was strong enough to hang a man, with success—not to the man, but to the municipal authorities.

Some time ago, one of the senior partners of an iron concern still in existence came to see us and, evidently in a disturbed state of mind, inquired whether we kept a record of the tests we made from time to time. The reply being in the affirmative, he requested a duplicate report of a test made on a certain date be given him, as he had lost the original. During the time the search was being made for the report asked for, it was very evident that this same gentleman was intensely exercised in his mind. In a short time he was informed that the report of the test was found and he was handed a duplicate copy. Upon receiving the copy he said: "This report is worth $6,000 to me, as it settles a dispute in our favor in which the matter of the strength of the material tested was brought up, and I see that the report is as I recollected and informed the other parties, but nothing could be done or settled until this report was reproduced."

One of the smallest machines we ever made was on an order of a gentleman who came to see us, who asked for a tensile testing

machine so small that it would break specimens of iron or steel about the size of the lead in an ordinary wooden lead pencil. This gentleman was Dr. P. H. Hudley. As you no doubt all know, this gentleman is a railroad company's doctor, and is called upon to solve every mechanical problem that could be conceived of arising in the operating of a railroad company outside of the bookkeeping and accounting departments. You have all heard of his car in which he and his wife lived and made their permanent home, if a home that is never permanent can be so called. Dr. Dudley was taking cores out of the web and flange of steel and iron rails and testing these diminutive specimens for their tensile strength; making comparative tests and drawing his inferences and results therefrom, and reporting to his clients the results. We carried this diminutive testing machine under our arm down to Washington street wharf to the home-car, and as far as we know it is in active use up to the present time.

A REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

IRON TRADE REVIEW.

MARCH 23rd.

A new process for drying sand and loam molds used in dry-sand castings has been perfected by Noah Shaw, of Eau Claire, Wis., the object sought by the inventor being uniform, thorough and speedy drying of molds, avoiding the features in the ordinary method that have proved objectionable. Ordinarily the molds are made in iron flasks and finished with "blacking" or "wash." The molds and flasks are then placed in ovens and subjected to heat for 12 to 48 hours. Then the cores are put in place and the molds closed before the molten metal is poured into them. By the process shown below the molds are finished, the cores put in place while the molds are soft and not liable to crumble or crush, and the molds closed and kept closed until they are opened for the removal of the casting. It gives a guaranty of a more perfect mold and hence of a more perfect casting. In the case of large castings the process possesses advantages over the method by which molds made in the floor or loam are dried by the use of baskets of charcoal. In the latter method, as the molds cannot be closed to retain the heat, portions are not reached by the heat, and therefore are not properly dried. In addition, other portions of the mold are burned and the molds are filled with ashes and cinder. The latter drawback appears also in the molds dried in an oven.

The method developed at Eau Claire consists in forcing heated air under pressure into the molds after they are finished and closed, thus forcing the moisture outward through the pores of the sand, the heated air which follows converting the moisture into vapor and leaving the pores of the sand open for the free escape of gases generated by the molten metal when poured into the mold.

MARCH 30th.

It is gratifying to note that the demands for advances in molders' wages in two important foundry centers have resulted

in an amicable adjustment of the matter, satisfactory to both sides. Local foundrymen's associations in Cincinnati and Cleveland, both attached to the National Founders' Association, have been instrumental in making this settlement without a strike and without any serious friction. The foundrymen concede a 10 per cent advance in wages, as in line with better conditions throughout the iron trade and in all industry; and the molders agree that in view of low-priced work now in the shops, on contracts that have some time to run, it would be equitable to postpone the enforcement of the advance to May 1. But a more important and significant result of the conferences between officers of the molders' union and of the foundrymen's local associations, is an agreement for annual conferences to adjust wages, so that the year shall be free from strikes and ill feeling, and losses due to the constant agitation of wage advances. The agreement also provides for the entire suspension of work on each alternate Saturday in June, July and August, while the remaining Saturdays are to be full work days. There is, in addition, a provision for pay for over-time and one for the adjustment of individual grievances. It is understood that Detroit and Buffalo will follow the example of Cleveland and Cincinnati; and with the movement thus well started its extension to other important centers should not be difficult. It is a pleasure to see such success attending one of the most salutary movements yet undertaken in any industry. Those who have had faith in such a development of the foundry association idea are entitled to high praise for their foresight, their persistence and for their broad-minded and intelligent advocacy of organization for defense and conciliation.

THE FOUNDRY.

James R. Douglass describes and illustrates the method of making original hollow ware patterns. Mr. Douglass says that castings bought upon the markets are unfit to make patterns of for the reason that they are not usually of uniform thickness. The proper way is to turn up wood blocks the size of inside of pattern required, the sheet lead of any desired thickness is

screwed onto the block in segments and soldered at the joints, with the exception of inside joints of swell pots and tea kettles, after which the whole thing is put back into the lathe and finished. The whole is rammed up and after removing the cope and cheek, the lead segments are removed from the block and placed in the cheek part of flask, which is then set upon the cope and the inside, or core, is then rammed up, also the nowel. Now the mold is once more opened and pattern segments backed off (in case of a swell pot), when the finished mold will be ready for final closing.

P. R. Ramp writes an illustrated article on the methods for making straight castings, such as sills, square columns, copings, etc. The plan, in brief, is to bend the pattern in the opposite direction to what it will naturally take in shrinking.

R. D. Moore contributes another number to the series of "Useful Foundry Hints," in which he discusses shrinkage, and the method that he successfully employed to repair a shrink hole in a valuable casting; also, he tells how he had found river sand to be an excellent sustainer of loam molds against pressure of liquid iron.

Oscar Oldman tells of "A Convenient Makeshift," by which he was enabled to cast gear wheels of several different sizes from a section of a gear casting. A sketch of the facilities used is given.

In the department of "Cast Iron Notes" Mr. W. J. Keep answers the question "Why there are not more founders who regulate the quality of their castings by regulating the quantity of silicon.

B. F. Chambers writes of his experience in casting pistons. To obviate shrinkage, and imperfections caused by dirt, the molds were cast open, that is, no cope was used. The pattern was drawn up one-half inch, and the joint of the drag was built up to the top edge, and then the pattern was entirely withdrawn. Cores were held down by chaplets, under a cross-bar, the extensions of the core through which the vent holes passed, projecting

above the joint of mold sufficiently to prevent the iron from getting into the vents. The extra half-inch in length of piston was given in order that the dirt, which naturally rises to the top, might be turned off in finishing the casting. No castings were lost from either dirt or shrinkage after this plan was adopted.

John M. Richardson, writing on the "Care of Patterns," says, in part: If a wood pattern is permitted to lie on the bench in such manner that one side is more exposed to the air than the other it will warp. The strongest argument for careful use of patterns is that they are vary costly. Light colored varnish is best for patterns, because the center lines show more plainly, making it easier to take measurements for repairing or altering. In storing, dampness and strong sunlight must be avoided.

THE TRADESMAN.

March 1: E. H. Putnam, writing upon "Mysteries," tells of his experience of the crushing of molds by imperfect cores. He was working on iron pump standards, using dry sand cores, which were made in halves. No trouble had been experienced for a long time, till, one day, two of the molds crushed at the core print, and the difficulties that sometimes beset the molder in searching for the cause of trouble was exemplified in this case. It was thought at first that the flask pins were imperfect, then that the core print, which had a bad season-check on one side, was at fault, and, last of all, the true cause was discovered, after several days of trial and more or less of loss each day, in the inaccurate joining of the two halves of the core, which was done in such manner as to extend the diameter of the joint diagonally from one quarter of the drag to the opposite quarter of the cope side.

March 15: A device for making cast iron gaggers is described, as follows:

It consists of an open cast iron mold, pivoted in an iron frame, the trunnions being located a little to one side of the center, so that, when the chill, or mold is right side up, it will be certain to remain so, till the operator shall apply force for the purpose

of overturning it, thus emptying the gaggers from the mold, when the operation of pouring may be resumed; and process may be kept up, of course, for any length of time.

The chill, or mold, may be about 12 inches wide by 24 inches long by, perhaps, 1¼ inches thick, with heavy trunnions at the ends. The frame that it is to set in may consist of a cast iron base plate, with three uprights. Two of these latter are stands to receive the trunnions while the third is simply a post, upon the top end of which the edge of the mold strikes when it is suddenly, and with considerable force, overturned to empty the castings out, the sudden jarring thus produced having the effect to loosen the casting from the iron mold. The height of the trunnion stands should be sufficient to permit the reversing of the mold without its being obstructed by, say, a couple dozen of gaggers that may be lying upon the base-plate beneath.

It goes without saying that this machine must never be used when rusty, wet or very cold.